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# The Econometric Model for the Economic and Financial Analysis of Romanian International Trade

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## ABSTRACT

*This paper describes the evolutions of the international trade of Romania during the recent period. The authors rely on official statistical data, drawn from the publications of the National Institute of Statistics and the results are presented using graphs of proper structure. The data are analyzed depending on the Combined Nomenclature, as reference for grouping statistic data.*

*These elements are usually encountered in the case of countries of low level as development. On an annual basis, the foreign trade activity has developed slowly from the point of view of the volume, which is negative as well as considering both components, import and export. The evolution of imports and exports has been stimulated also by the slight appreciations of the national currency.*

*At the same time, the positive element of currency appreciation implies a negative effect on the exports. Along with the effects of the economic and financial crisis, another element which has generated a slower rhythm evolution for imports and exports consists of the fact that the process of privatization and restructuring, involved the closure of a number of companies. Those data were analyzed and interpreted, based on a system of indicators which reflects the evolutions and perspectives of economic international exchanges. Also, we focused on the structure of the foreign trade, having in mind the geographic space, goods and services structure, structure of partners and volume of imports and exports of the same goods or from/to same country. As methodology, we used econometric and statistical methods and models, adapted based on the data series. In order to cover many aspects of the international trade, we provided out some data, from different periods and, after analysis, we took out some pertinent conclusions. The analysis was performed from the economic and financial viewpoints. On the other hand, the analyses of international trade were made in connection with the evolution of the Gross Domestic Product. The data on GDP were considered for the same period, and all data are deflated.*

**Key words:** export, nomenclature, import, sector, results

**JEL classification:** C14, C25, F14, F17, F47

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## INTRODUCTION

In this paper, the research is focused on the analysis of the Romanian international trade. The export can be considered as a significant factor for the progress of the Romanian economy, and the development of connections to the international flows of goods and services is expected to contribute to the awareness on the competitive advantages of Romania. The econometric instruments are meant to help the analysts in measuring the correlations between economic indicators in order to outline the quantitative aspects of the impact posed by one or more factorial variables on a result parameter, usually an important indicator at the macroeconomic or microeconomic level. The measure of the impact on the foreign trade on the Gross Domestic product might thus be analyzed by using an econometric instrument applied, of course, on the proper dataset.

## LITERATURE REVIEW

Anghel (2014) develops on the usability of econometric models in correlations between macroeconomic variables, also Anghelache and Anghel (2015) describe the analysis of GDP based on statistic-econometric models. The volumes coordinated by Anghelache (2014, 2013) approach the measurement of economic correlations by using statistical-econometric instruments. Anghelache (2015) describes the macroeconomic situation of Romania in 2015, including a presentation on the structure, formation and evolution of GDP, and also an analysis on the foreign trade indicators. Anghelache, Manole and Anghel (2015) study the influence of final consumption and gross investments on the GDP. A previous research by Anghelache and Anghelache (2012) outlined the correlation between GDP and final consumption, Censolo and Colombo (2008) analyse the composition of public consumption in the case of a growing economy. The export potential of Romania is presented by Rădulescu (2013). Anghelache and Manole (2012) focus on the correlation between GDP and direct investments, Mitrut et al. (2014) realize an analysis on the impact of foreign direct investments on economic growth. Schonhauer approaches the regional GDP and unemployment rate of Romania.

Ansley and Newbold (1980) present some properties of the estimators when a certain class of models is applied. Atkinson (2013) describes the characteristic rules for balance of payments accounting. Gardasevic (2013) presents, for Montenegro, the influence of foreign direct investments on the payment balance. Bachman (2011) develops on the influence of public consumption on the business cycle. The works of Bardsen, Nymagen and Jansen (2005), Corbae, Durlauf and Hansen (2006), Dougherty (2008), Mitruț

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(2008), Benjamin, Herrard, Hanese-Bigot and Taveré (2010) offer significant and reliable reference materials for statistic and econometric analyses and forecast studies. 5. Turnovsky (2000) focuses on the macroeconomic evolutions. Anghelache and Manole (2012) present an analysis of Romanian foreign trade. Anghelache (2008) describes the correlation between the measures of the external balance and the macroeconomic outcomes aggregates.

Eckehoudt, Gollier and Schlesinger (2005) analyze the risk factor in economic decisional context, Rothschild and Stiglitz define the increasing risk (1970). Ghysels, Granger and Siklos (1998), Ghysels and Osborn (2001) and Harvey (1993) study the characteristics of time series. Chang and Li (2015) focus on the measurement errors, specific to Gross Domestic Product and Gross Domestic Income. BurrIDGE and Taylor (2000) approach the properties of regression-based tests for seasonal unit roots. Durland and McCurdy (1994) analyze some properties of a Markov model applied on the United States economy.

In this respect, we will analyze and present some evolutions of the foreign trade indicators during 2015.

In 2015, the value of FOB exports reached the level of 54,598 million euro. A comparison with the similar period of 2014 reveals an increase with 4,07%, while, against 2013, we have an increase by 10%.

The dynamic and structural analysis of exports, depending on the CN sections outlines major increases for sections “Optical instruments and apparatus...”- with 24%, “Food, Beverages and Tobacco products”, by 18%, “Electrical machineries, tools and apparatus”, by 11%<sup>1</sup> etc.

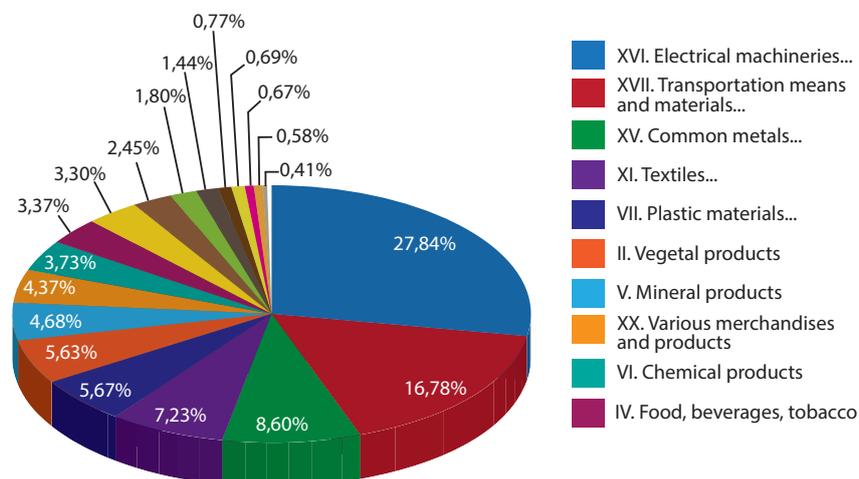
Also, it can be observed the contribution of the major CN sections to the FOB exports of Romania in 2015:

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1. Data analysis based on the TEMPO Online data, provided by the National Institute of Statistics of Romania, series “*The value of exports (FOB) according to CN sections and chapters, total, of which the European Union*”

## MAIN EXPORTS OF ROMANIA, 2015

Figure 1



Data source: National Institute of Statistics of Romania, Tempo Online database

The exports belonging to the sector “XVI. Electrical machineries...”, takes the first position in the hierarchy, with a quota of 27.84% of total exports for 2015. Compared to the previous year, an increase of 11.34% was recorded. The sector has a leading position in total section and in the total FOB exports.

The second position is held by the section “Transportation means and materials” with a weight of some 16.8% in total FOB exports. Inside this section, the sector “Vehicles, tractors and other ground vehicles” accounted for a major part.

The section “XV. Common metals...” has the third place as weight in total exports. The comparison with 2014 reveals a minor decrease.

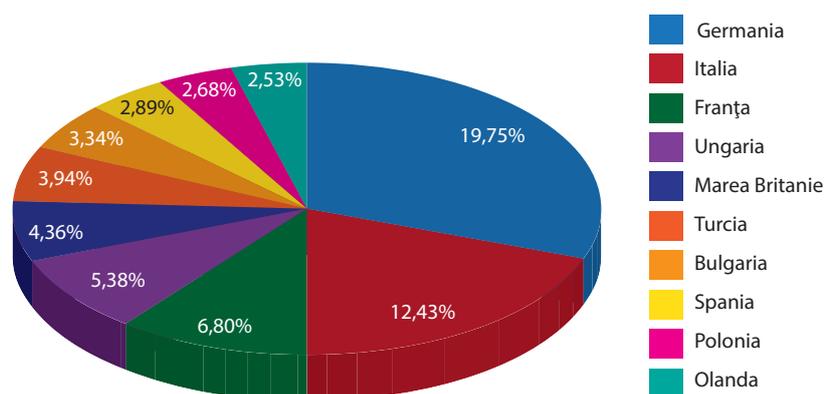
Furthermore, the comparison between data recorded during 2015 as against 2014 allows to draw the conclusion that exports to the other European Union countries increased by 2.59 percentage points, that is from 71,12% to 73.71%.

The structure of export by partner countries includes a dataset related to 10 partner states accounting for the majority of total exports (over 64%). These data are also synthesized in the chart below as relative weights:

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## MAIN EXPORT PARTNERS OF ROMANIA, IN RELATIVE FIGURES, IN 2015

Figure 2



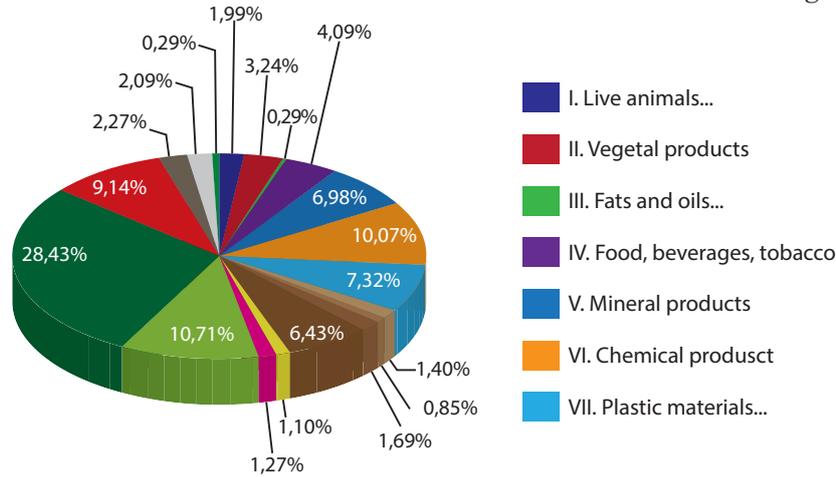
**Data source:** National Institute of Statistics of Romania, Tempo Online database, graphical representation by authors

During the year 2015, CIF imports accounted for 62,968 million euro, increasing with 7.6% as against the previous year, 2014 and by 13,8 against 2013.

The structural analysis of imports, shows the fact that several sections of the Combined Nomenclature hold the major slice of total imports, as described in the chart below:

## MAIN IMPORTS OF ROMANIA IN 2015

Figure 3



**Data source:** National Institute of Statistics of Romania, Tempo Online database, graphical representation by authors

As regarding the imports of chemicals products, an increase is observed when comparing with the previous year data, having a relative value of 6.35%. The share of this sector is 10.07% (in total imports). The data related to the section “Common metals...”, reveal a share of 10.71% in total imports, and also an increase with 3 percentage points, as contribution to the total result, compared to the previous year figures.

Depending on the CN sections, the structural analysis reveals the major evolution in the import activity (comparison 2015 as against 2014):

- Major increase for “XVI. Electrical machineries...”: 3.05 points;
- Decrease for “XII. Footwear, hats...” and “V. Mineral products”;
- Visible increase for “XVII. Transportation means and materials”:

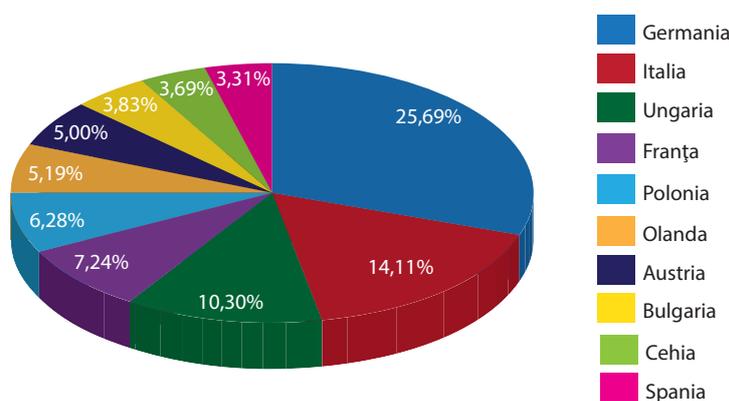
1.17 points.

The European position of Romania’s imports is characterized by an increase in 2015 as against 2014, that is from 75.39% to 77.16%.

The most important international trade partners during the 2015 are outlined by their relative contribution, shown in the chart below:

## MAIN ROMANIA'S IMPORT PARTNERS IN 2015, RELATIVE CONTRIBUTIONS

*Figure 4*



**Data source:** National Institute of Statistics of Romania, Tempo Online database, graphical representation by authors

During the period 1.I – 31.VII.2015, the exports and imports increased by 5.9%, respectively by 7.0%, comparatively with the period 1.I – 31.VII.2014. During the period 1.I – 31.VII.2015, the FOB exports amounted 32072.4 million euro while the CIF imports amounted 36007.5 million euro. The commercial balance deficit (FOB/CIF) during the period 1.I – 31.VII.2015 counted for 3935.1 million euro, by 561.0 million euro bigger than the one recorded for the period 1.I – 31.VII.2014.

In July 2015, the FOB exports amounted 5043.3 million euro, the CIF imports amounted 5684.9 million euro, resulting a deficit of 641.6 million euro. As against June 2015, the exports of July 2015 increased by 5.8% while the imports increased by 3.6%.

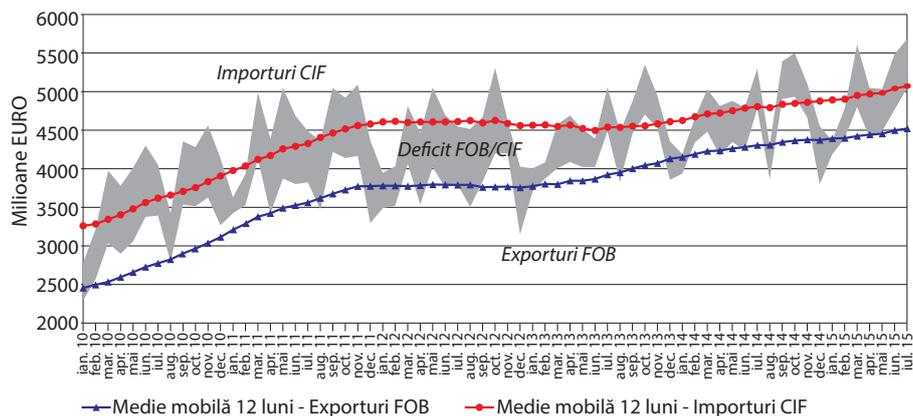
On an overall basis, we can appreciate that the foreign trade activity did develop negatively from the point of view of the volume but negatively as well as considering the two components, import and export.

The decrease of the exports and imports has been stimulated also by the slight appreciation of the national currency. On this ground, the positive element of the appreciation (volatility) of leu implies a negative effect on the exports.

Many of the exporters either tempered their activities, or recorded modest gains to the best, if not pure losses.

## EXPORTS, IMPORTS AND TRADE BALANCE IN JANUARY 2010 - JULY 2015

*Figure 5*



**Data source:** National Institute of Statistics website

[http://www.insse.ro/cms/files/statistici/comunicate/comert\\_ext/a15/ce06r15.pdf](http://www.insse.ro/cms/files/statistici/comunicate/comert_ext/a15/ce06r15.pdf)  
accessed August 17<sup>th</sup>, 2016

Along with the effects of the economic and financial crisis, another element which generated a slower rhythm of evolution of the exports and imports, consists of the fact that the process of privatization and restructuring involved the closing-up of a number of companies or autonomous State supervised administrations, as well as of the fact that the quality of the manufactured products was not in the position to meet the foreign customers requirements.

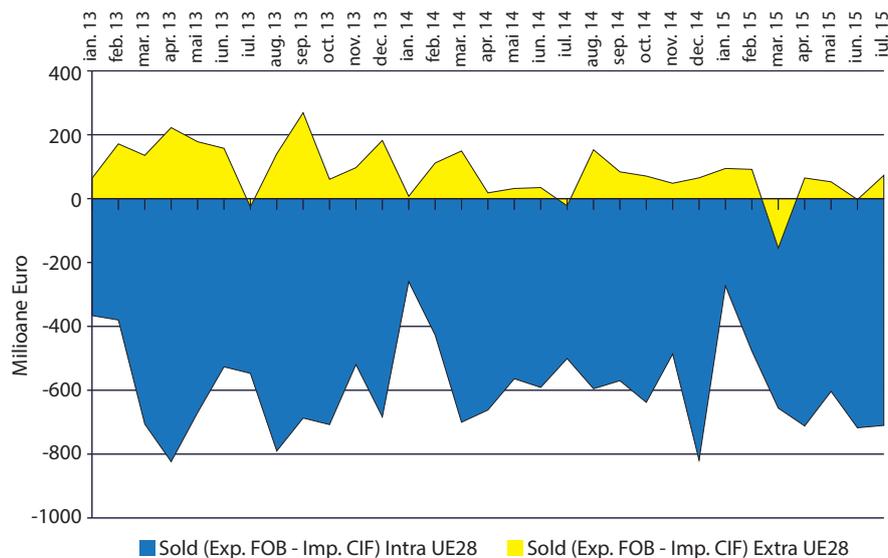
The main aspect apart the export structure by major categories of goods (capital, intermediary and consumption goods) is represented by the fact that the massive reduction of the exchange of intermediary goods, mainly as far as the import are concerned was of the nature to diminish the productive capacity of the industry and other activities as well, during the last months of the year 2008, jeopardizing meantime the perspective of the economic activities for the months to come.

From the point of view of the dynamics of the trade with the partner countries, to note for both import and export, the decreases recorded for almost all the cases, some of them quite significant.

The commercial deficit FOB-CIF during the period 1.I-31.VII 2014 was 14925.0 million (3356.1 million euro), greater with 1265.6 million lei (248,4 million euro) than the one recorded for the period 1.I-31.VII 2013.

**SOLD OF THE COMMERCIAL BALANCES INTRA-UE28  
AND EXTRA-UE28 DURING THE PERIOD JANUARY  
2013 – JULY 2015, DATA IN MIL. EURO**

*Figure 6*



**Data source:** National Institute of Statistics website

[http://www.insse.ro/cms/files/statistici/comunicate/comert\\_ext/a15/ce06r15.pdf](http://www.insse.ro/cms/files/statistici/comunicate/comert_ext/a15/ce06r15.pdf)

accessed August 17<sup>th</sup>, 2016

The values of the intra-communitarian (Intra-UE28) exchange of goods during the period 1.I-31.VII 2014 was 96622.2 million lei (21687.5 million euro) for deliveries and 113090.4 million lei (25386.6 million euro) for inputs, that is 71.6% of total export and 75.4% of total import. The value of the extra-communitarian (Extra-UE28) goods exchange during the period 1.I-31.VII 2014 was 38516.4 million lei (8611.8 million euro) for export and 36973.2 million lei (8268.8 million euro) for import, representing 28,4% of total export and 24,6% of total import.

**ECONOMETRIC ANALYSIS OF THE CORRELATION  
BETWEEN GDP AND FOREIGN TRADE INDICATORS**

The research methodology is based on the multiple regression, which aims to describe the correlation between a parameter, which is considered

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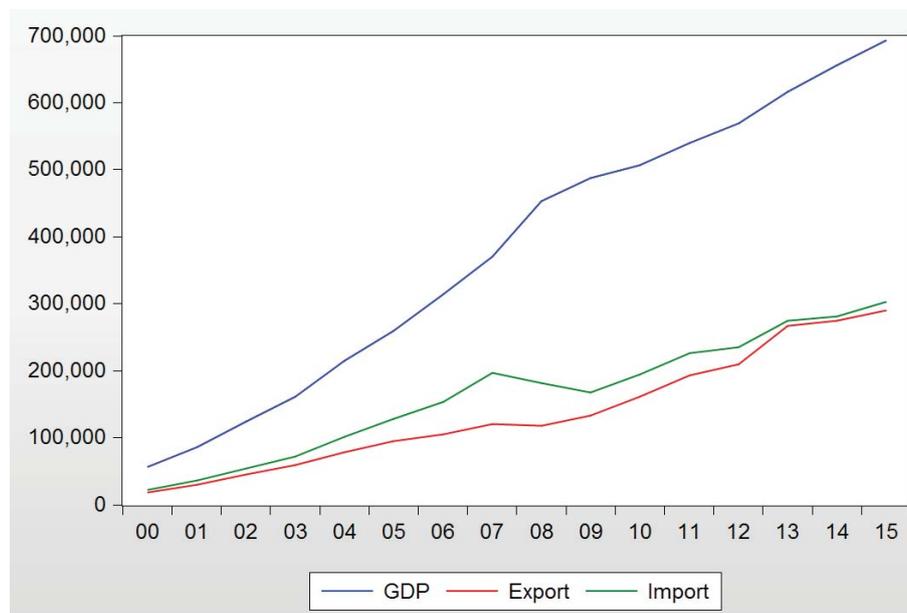
more important in the scope of the analysis, and two or more factor variables. The multiple regression is useful when the analysis based on a single factor is not explanatory enough, this idea can even be suggested by the value of the free term.

The multiple regression presented is based, as stated before, on official data, which were processed with the help of a specialized software.

In this section, we shall present an econometric model destined to analyze the multiple correlation between the Gross Domestic Product and the export, import as input factors. There is a known fact that the indicators related to foreign trade deeply influence the Gross Domestic Product.

The analysis is made for Romania, the interval considered is 1996-2015, and the dataset is drawn from the National Institute of Statistics of Romania Tempo Online Database, dataset coded as CON111G.

First, the graphical representation of GDP vs. export and import outlines the relative evolutions of the three datasets. The similarities between the three lines allow us to try and draw a multiple regression econometric model.



Using a specialized software application, the parameters of the model were estimated in the following form:

Dependent Variable: GDP  
 Method: Least Squares (Gauss-Newton / Marquardt steps)  
 Date: 08/17/16 Time: 16:44  
 Sample: 2000 2015  
 Included observations: 16  
 GDP=C(1)+C(2)\*IMPORT+C(3)\*EXPORT

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	5325.902	26073.10	0.204268	0.8413
C(2)	1.951858	0.531913	3.669503	0.0028
C(3)	0.404470	0.539051	0.750337	0.4664
R-squared	0.962507	Mean dependent var		381771.7
Adjusted R-squared	0.956739	S.D. dependent var		212022.3
S.E. of regression	44099.27	Akaike info criterion		24.39363
Sum squared resid	2.53E+10	Schwarz criterion		24.53850
Log likelihood	-192.1491	Hannan-Quinn criter.		24.40105
F-statistic	166.8650	Durbin-Watson stat		0.969304
Prob(F-statistic)	0.000000			

Thus, the model can be transcribed in the following manner:  

$$GDP = 5325.902 + 1.951858 * IMPORT + 0.404470 * EXPORT$$

The statistical tests of the model outline its reliability and its foundation to be used for future predictions. The values of  $R^2$  and Adjusted  $R^2$  are close to unit, therefore the model is sound for the purpose of our analysis. The results of the model can be interpreted in the following manner:

- The value of the free term is significant (high), meaning that there are other factors, not yet taken into consideration, that influence the Gross Domestic Product of Romania.
- The quotient for the IMPORT variable means that an increase of the import by 1 leu leads to the increase of Gross Domestic Product by an almost twofold amount (1.951858 lei), which gives the measure of the Romanian economy dependence on import.
- An increase of export by 1 leu generates only 40% impact on the Gross Domestic Product (slightly over 0.4 lei), which is significantly lower than the import influence.

Also, the net export could have been taken into consideration, but its values do not allow the inclusion of its dataset into the multiple regression.

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## CONCLUSIONS

Regarding the influence of the export, an increase of export by 1 leu should lead to the increase of GDP by an amount which slightly rises above 0.4 lei, which is a correlation that we hope to improve in the future, along with the development of Romanian export capabilities and results. The import has a quotient close to two, but there is a gap between exports and imports, revealed by the net export parameter, which is negative for the entire time interval of the dataset. Closing this gap will reduce the dependence of Romanian economy on imports and shift the focus to exports.

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